

# CRASHWORTHINESS RESEARCH NEWS

---

Volume 1, Number 3

November 1996

---

## TRB WORKSHOP ON ROADSIDE SAFETY

Dr. Tom Hollowell traveled to Park City, Utah, to participate in the "Strategies for Improving Roadside Safety" workshop held by the Roadside Safety Features Committee of the Transportation Research Board (TRB).

Almost two years ago, TRB initiated a project to formulate a strategic, multi-faceted approach to improve roadside safety that will guide all parties involved in highway safety to maximize their effectiveness of their efforts through coordination and partnering. Dr. Hollowell was selected to the panel that was convened for this project, and he actively participated in the panel's development of a draft strategic plan. This plan defines the mission, goals, objectives, and activities aimed at reducing the number and severity of roadside crashes.

The Park City workshop was held to have the critical elements of the plan reviewed and refined by a broader scope of groups involved in all aspects of highway safety in order to enhance the viability of the plan. The groups represented diverse parties such as State departments of transportation, motor vehicle manufacturers, the insurance industry, universities, manufacturers of

roadside safety

hardware, and even MADD. Dr. Hollowell was a featured speaker at the workshop, and addressed the audience regarding emerging vehicle technologies for improving occupant protection.

At the workshop, the participants were asked to suggest action items and implementation strategies during breakout sessions. The focus of these sessions were the five missions identified in the plan--build a network of partners to increase the awareness of roadside safety, keep vehicles from leaving the road, keep vehicles from overturning or striking roadside objects, minimize the injuries when vehicles overturn or hits objects, and build and maintain management structures and information to support roadside safety improvement. Currently, the TRB panel members are incorporating the recommendations into the plan.

---

## INFLATABLE TUBULAR STRUCTURES DEMONSTRATED

Steve Summers traveled to Detroit to witness a demonstration of the use of Inflatable Tubular Structures (ITS) on heavy trucks.

The ITS device is a novel non-deflating air bag that deploys across a vehicles' side windows. The ITS device is designed to reduce injuries from head impact and side window ejection.

The U.S. Army Tank Command, in cooperation with Simula Inc demonstrated ITS systems that were designed for preventing rollover injuries on a Palletized Load System truck. These large trucks have a significant number of head to ground injuries during rollover accidents. The ITS system demonstrated appeared to have good potential for mitigating these head to ground contacts.

---

## **UPGRADED SYSTEM FOR CRASH TEST DATA ACQUISITION SYSTEM EVALUATION**

NHTSA continuously collects data from vehicle, component and biomechanics tests performed by several crash sites under the agency auspices. Analyses of these data form a basis for directing agency research efforts and for ensuring compliance to various safety standards such as FMVSS No. 208 (Occupant Protection), FMVSS No. 214 (Side Impact Protection), and FMVSS No. 301 (Fuel System Integrity). These data are also the bases of various NHTSA published reports, including consumer information such as the New Car Assessment Program news releases. As such, ensuring the correctness and accuracy of the collected test data is critical and essential to carry out NHTSA's mission.

Since 1987, the agency has been providing a specialized hardware and software system to its contractor crash test sites to evaluate and check out their test instrumentation and data acquisition practices. This evaluation

involves calculation of timing, amplitude, and frequency content errors that are introduced by the crash site's instrumentation and data collection to signals of known characteristics. These signals are representative of crash test data and are generated by the specialized hardware. The requirements on the allowable error tolerances are based on the Society of Automotive Engineer's Instrumentation for Impact Tests, SAE J211. The specialized hardware provided by agency to the sites is a custom built signal waveform generator (SWG). The signal processing software used to compute the performance errors currently resides at NHTSA and the analysis of the sites' instrumentation evaluation is performed by the agency.

As more experience was gained with the SWG hardware, requests to borrow these units from crash test sites world wide increased until they exceeded the ten available units. The SWG was custom designed and built in the early 80's. Although the basic electronic design is good, its mechanical construction left the SWG vulnerable to shipment damage from one site to another and reliability on site was poor.

Since the required technology is now available, NHTSA has recently developed and tested an upgraded system that uses commercially available hardware wherever possible. The new hardware consists of a commercial PC based arbitrary waveform generator board and a simple electronic output distribution box. Software to provide the desired signal of known characteristics have been developed for the hardware board. The overall system can be used by any crash or sled test site in the world to evaluate their own system. It also has minimal upkeep and maintenance requirements. In addition, it provides a variety of voltage level outputs

in order to better match the different crash transducer outputs. Eight units of the selected PC based arbitrary waveform generator, the Keithley Metrabyte AWFG/2, have recently been acquired to be used in introducing the upgraded system at selected NHTSA and FHWA crash test sites. MGA Research will be the first crash site at which the new system will be introduced.

The new system is described in a 15th ESV Conference paper, May 1996, "An Upgraded System for Crash Test Data Acquisition Evaluation", paper # 96-S9-W-27, authored by John Nickles and Randa Radwan Samaha.

---

## OCCUPANT MODELS DEVELOPED FOR FINITE ELEMENT ANALYSIS



N H T S A  
s p o n s o r e d  
L a w r e n c e  
L i v e r m o r e  
Laboratories for  
the development  
of a program to  
generate rigid  
e l l i p s o i d s  
occupant models  
for use with

LSDYNA and LLNL DYNA finite element analysis programs.

The febod program is an extension of the Gabbed program developed by Wright Patterson Air Force Base, Armstrong Laboratory. This program can generate human and dummy body descriptions using rigid ellipsoids and connected with DYNA joints. The geometric and mass properties, joint location, and mechanical properties are computed for children, adult human males or females, and for anthropomorphic dummies.

Based on user input data on occupant age, size, height, and/or weight, the febod program generates an appropriate INGRID input deck for either LS-DYNA or LLNL DYNA.

The source code for this program is publicly available from the NHTSA WWW site at <http://www-nrd.nhtsa.dot.gov/nrd10/nrd11/fea.html>.

---

## TRANSPORTATION EDUCATION CONFERENCE

Catherine McCullough traveled to Knoxville, Tennessee to participate in Transportation Education Conference sponsored by the U.S. Department of Transportation. Attendees included representatives from transportation and related industries, educational institutions, and federal, state, and local governments.

The purpose of the conference entitled "Building Transportation's Bridges to the 21st Century", was to highlight accomplishments in transportation education and to encourage the formation of partnerships in the transportation enterprise.

Deputy Secretary of Transportation Mortimer L. Downey outlined the Department's record of accomplishments in transportation education in his keynote address.

Exhibits featured informative demonstrations and examples of the broad range of DOT-sponsored and related transportation education programs. Research and Development's exhibit provided an overview of the major research initiatives underway in

that area. NHTSA's hot line exhibit, which displayed information pertinent to the operation of NHTSA's Auto Safety Hotline, was staffed by Ernie Wittich from the Office of Defects Investigations. Noble Bowie, Acting Director of Safety Performance's Office of Planning and Consumer Programs also attended and assisted in staffing the two exhibits.

Panelists from private sector firms, state/local government agencies and academia addressed the following transportation issues:

- \* What challenges will face the transportation professional of the future?
- \* What are we doing now to prepare the transportation professional of the future to meet those challenges?
- \* How can transportation compete with other disciplines to capture the best and the brightest?

---

---

## **AIR BAG SYSTEMS TASK FORCE/SAE INFLATABLE RESTRAINTS STANDARDS COMMITTEE MEETING**

Lori Summers from the Office of Crashworthiness Research attended the Air Bag Systems Task Force meeting and the SAE Inflatable Restraints Standards Committee in Romulus, Michigan.

The Air Bag Systems Task Force meeting began by reporting results from organized round robin Industry Gas Analysis Testing. Participation in the testing was voluntary, and deemed beneficial to most industry members in determining where suppliers stood with respect to their competitors. Participants included: Morton, TRW, Allied

Signal, Breed, Delphi, Olin, ASL (Takata), and Talley. A summary report of this first round of testing will be written, and a suggestion was made that future voluntary testing be conducted at 18 month intervals.

Final modifications were also added to the J1794 Restraint Systems Effluent Test Procedure. This document is ready to be balloted within the committee. This SAE recommended practice describes a method to identify and quantify effluent resulting from deployment of in-vehicle stored energy restraint systems. SAE Recommended Practice J1856, Identification of Automotive Air Bags, was due for a five year ballot review; the committee members present suggested that the document be balloted for cancellation since the scope of the recommended practice is now inadequate.

Finally, upcoming Task Force priorities were voted on by the committee. Initially, the defining and testing of smart air bag systems was acknowledged by the committee as one of the most significant issues in the industry. However, an overwhelming majority of the members felt that the scope of the work was too large for the committee to address at the present time. Therefore, a suggestion was made to reconsider the topic at a later date.

Two new future Task Force activities will focus on developing system level testing and evaluation of air bag deployment sound, and thermal/burn effects. The next meeting is scheduled for December 1996.

---

---

## **TRB SUBCOMMITTEE ON COMPUTER SIMULATION**

Randa Radwan Samaha, the NHTSA representative on the TRB Committee

(A2A04) on Roadside Safety features traveled to Park City, Utah to attend the summer meeting of the TRB Subcommittee A2A04(1) on Computer Simulation. The focus of the meeting was discussing and prioritizing the research under the General Plan for Advancing the State-of-the-Art of Simulating Vehicle Impacts with Roadside Safety Features.

NHTSA is planning to develop finite element models of vehicles representing the various vehicle classes including passenger cars, and light trucks and vans. The roadside safety community, in particular the Federal Highway Administration, will be utilizing these detailed structural models in their simulation studies for guardrails and signposts, ect.

---

---

## CREDITS

This is the third issue of an informal newsletter that R&D's Office of Crashworthiness Research publishes periodically on their activities.

Office Director      Ralph J. Hitchcock  
202-366-4862

Editor                      Catherine McCullough  
202-366-4734

Editorial Assistant      Lisa Liriano  
202-366-3955

Contributors to this issue:

Tom Hollowell	202-366-4726
Catherine McCullough	202-366-4734
Randa Radwan Samaha	202-366-4704
Lori Summers	202-366-6734
Steve Summers	202-366-4712